

The genus *Laomedia* De Haan, 1841 with description of a new species from Vietnam (Crustacea, Thalassinidea, Laomediidae)

Nguyen NGOC-HO

Laboratoire de Zoologie (Arthropodes), Muséum national d'Histoire naturelle
61 rue de Buffon, F-75231 Paris cedex 05 (France)

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ABSTRACT

To the genus *Laomedia* De Haan, a fourth living species from Vietnam, *Laomedia paucispinosa* n.sp., is added. New material of *Laomedia astacina* De Haan, 1841, from China, Japan, Taiwan, Vietnam, the holotype of *Laomedia barronensis* Ngoc-Ho et Yaldwyn, 1997, and a paratype of *Laomedia healyi* Yaldwyn et Wear, 1970, both from Australia, have been examined. Diagnoses of the genus and of each extant species are given, together with their descriptions and a key. *Laomedia* adults and larvae are compared to those of the other genera of the Laomediidae, and on the basis of a phylogenetic analysis using seventeen characters, two subfamilies, Laomeniinae and Axianassinae, are recognized.

KEY WORDS

Crustacea,
Decapoda,
Thalassinidea,
Laomediidae,
Laomedia,
taxonomy,
Indo-Pacific.

RÉSUMÉ

Au genre *Laomedia* De Haan, s'ajoute une quatrième espèce actuelle, *Laomedia paucispinosa* n.sp., du Vietnam. Un nouveau matériel de *Laomedia astacina* De Haan, 1841, provenant de Chine, du Japon, de Taiwan, du Vietnam, l'holotype de *Laomedia barronensis* Ngoc-Ho et Yaldwyn, 1997, et un paratype de *Laomedia healyi* Yaldwyn et Wear, 1970, tous deux d'Australie, ont été examinés. La diagnose du genre et celle des espèces actuelles sont présentées ainsi que leur description et une clé. Les adultes et les larves de *Laomedia* sont comparés à ceux des autres genres de Laomediidae et une analyse phylogénétique fondée sur dix-sept caractères révèle deux sous-familles : les Laomeniinae et les Axianassinae.

MOTS CLÉS

Crustacea,
Decapoda,
Thalassinidea,
Laomediidae,
Laomedia,
système,
Indo-Pacifique.

INTRODUCTION

The genus *Laomedea* De Haan, 1841 belongs to the thalassinidean family Laomedidae with four other genera: *Jaxea* Nardo, 1847, *Naushonia* Kingsley, 1897, *Axianassa* Schmitt, 1924, and *Laurentiella* Le Locuff *et* Intès, 1974. Among these, *Axianassa* and *Naushonia* have most described species: six of *Axianassa* from the American coasts (see Kensley & Heard 1990; Rodrigues & Shimizu 1992) and six of *Naushonia* from the American coasts, the Red Sea and Mozambique (see Martin & Abele 1982; Berggren 1992). More material of the above genera, mainly from the Americas, are being discovered and studied (Lemaitre, pers. comm.). In contrast, only the type species of both *Jaxea* and *Laurentiella* have been reported: the former, *J. nocturna* Nardo, 1847, is distributed in North-East Atlantic, along the English Channel and the Mediterranean, the latter, *L. heterocheir* Le Locuff *et* Intès, 1974, is from the Ivory Coast.

Laomedea is represented by three living species: *L. astacina* De Haan, 1841 (type species) from Japan, *L. healyi* Yaldwyn *et* Wear, 1970 and *L. barronensis* Ngoc-Ho *et* Yaldwyn, 1997, from eastern Australia. A fossil species, *L. praeastacina* Karasawa, 1989, is known from the Miocene Mizunami Group, central Japan. The latter, considered by its author as distinct from *L. astacina* (see Karasawa 1989: 6) and which has only pereopods 1-4 uncovered, is not treated in this work. A new extant species, *Laomedea paucispinosa* from Vietnam, is described here. Supplementary information and illustrations for the other *Laomedea* are provided (most information on *L. healyi* being kindly provided by J. C. Yaldwyn), together with an identification key.

The Laomedidae is a small yet diverse family. Its validity has been questioned but its morphology is now defined with a number of adult characters cited in the diagnosis, complemented by the asymmetrical larval mandibles reported in all genera (except *Laurentiella* whose larvae are not known). Still, important differences exist between the genera of the Laomedidae and these are discussed. A cladistic analysis was performed in an attempt to elucidate their relationships on the basis of the material available at present.

Measurements given (in millimeters) in the descriptions are: carapace length (cl.) measured from the apex of the rostrum to the posterior border of the carapace; total length (tl.) from the apex of the rostrum to the posterior border of the telson. References cited with an asterisk (*) deal with larvae.

The material examined come from the collections of:

- AM Australian Museum, Sydney
- BM Natural History Museum, London
- MNHN Muséum national d'Histoire naturelle, Paris
- QM Queensland Museum, Brisbane
- RMNH Rijksmuseum van Natuurlijke Historie, Leiden
- SMF Senckenberg Museum, Frankfurt
- ZRC Zoological Reference Collection, University of Singapore

Family LAOMEDIIDAE Borradaile, 1903

Laomedidae Borradaile, 1903: 540. – De Man 1928: 15. – Gurney 1938*: 332, 343 (key); 1942*: 249. – Bouvier 1940: 97. – Balss 1957: 1580. – Wear & Yaldwyn 1966: 2, 3 (key). – Yaldwyn & Wear 1972: 127. – Le Locuff & Intès 1974: 20. – Thiriot 1974*: 349. – Poore & Griffin 1979: 224. – Goy & Provenzano 1979: 351. – Naiyanetr 1980: 23. – Ngoc-Ho 1981*: 251. – Abele & Fengenbauer 1982: 306. – Williams 1984: 189. – Konishi 1989*: 15. – Poore 1994: 103, 104 (key).

Axianassidae Schmitt, 1924: 76. – De Man 1928: 15. – Gurney 1938*: 343; 1942*: 249. – Wear & Yaldwyn 1966: 2. – Yaldwyn & Wear 1972: 127. – Le Locuff & Intès 1974: 20.

DIAGNOSIS (adapted from Poore, 1994)

Carapace with *linea thalassinica* present; cervical groove distinct; posterior margin of carapace with lateral lobes, abdominal somite 1 with anterolateral lobes (see Poore 1994, figs 7a, b); rostrum small; eyestalks cylindrical; maxilla 2 with several long thickened setae on posterior margin of scaphognathite. Maxilliped 1 with endopod dilated distally; maxilliped 3 ischium bearing a mesial toothed crest. Pereopods 1 chelate or subchelate; pereopod 2 simple; pereopods 3 and 4 propodus with few or no spiniform setae on lower margin;

pereopod 3 propodus linear. Pleopod 1 female uniramous; pleopod 1 male absent; pleopod 2 similar to pleopods 3-5, rami lanceolate; *appendix interna* absent from pleopods. Uropodal exopod ovate. Zoea larvae with asymmetrical mandibles, the left of which sickle-shaped.

Genus *Laomedea* De Haan, 1841

Laomedea De Haan, 1841, 1849: 164. — Borradaile 1903: 540. — Balss 1914: 88. — De Man 1928: 16. — Sakai & Miyake 1964: 86. — Le Locuff & Intès 1974: 23. — Poore & Griffin 1979: 284. — Poore 1994: 104.

TYPE SPECIES. — *Laomedea astacina* De Haan, 1841.

DIAGNOSIS

Rostrum approximately triangular, with one or two distal teeth. Eyestalks short, cornea well pigmented. Antennular peduncle with ultimate article elongated. Antennal scale small, rounded in outline. Mandible with round teeth on whole cutting edge, palp 2-segmented. Maxilliped 3 with ischium bearing a prominent mesial toothed crest. Branchial formula as given in table 1. Pereopods 1 chelate, subequal, similar. Pereopod 2-5 simple. Uropodal rami both with a transverse suture. Zoea larva with "neck" region and sixth abdominal segment elongated. Rostrum small, curved. A pair of ventral hooks on abdominal segments 1-5 in all stages, on abdominal segment 6 from stage 3. Telson trian-

gular with large base, one lateral process and deep median cleft in stages 1 and 2; base narrower, three lateral processes, median cleft small or absent from stage 3.

TABLE 1. — The branchial formula in known species of *Laomedea* (after Yaldwyn & Wear 1972).

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Pleurobranchs	—	—	—	—	—	—	—	—
Arthrobranchs	1	2	2	2	2	2	2	—
Podobranchs	—	1	1	1	1	1	—	—
Epipods	1	1	1	1	1	1	1	—
Exopods	1	1	1	—	—	—	—	—

REMARKS

Several authors (De Man 1928; Sakai 1962; Kensley & Heard 1990; and Poore 1994, among others) cited 1849 as the date of publication of *Laomedea* De Haan and of its type species, *Laomedea astacina*, which appeared in De Haan's volume (1933-1950) in von Siebold's *Fauna Japonica*. But, according to Holthuis (1953), Holthuis & Sakai (1970), and Yaldwyn & Wear (1972), the generic name *Laomedea* and plate 35 with the name *Laomedea astacina* n.sp. in the caption were first published in 1841, although the generic and species description did not appear until 1849. Yamaguchi & Baba (1993) confirmed this view.

KEY TO THE LIVING SPECIES OF *Laomedea*

1. Antennular peduncle shorter than antennal peduncle, postocular spine present ... 2
- Antennular peduncle as long as antennal peduncle, postocular spine absent 3
2. Rostrum approximately triangular, two distal, five to seven lateral teeth, one postocular spine *L. astacina*
- Rostrum rounded, one distal, three to six lateral teeth, one postocular spine and one spine behind origin of *linea thalassinica* *L. healyi*
3. Rostrum triangular, one distal tooth, lateral borders unarmed, pereopod 1 propodus non dilated distally, telson with shallow median groove on posterior half *L. paucispinosa*

- Rostrum approximately triangular, two distal, one lateral tooth, pereopod 1 propodus dilated distally, telson without median groove *L. barronensis*

***Laomedia astacina* De Haan, 1841**
(Fig. 1)

Laomedia astacina De Haan, 1841, 1849: 165, pl. 35, fig. 8, pl. N (mouth parts). — Ortmann 1891: 31. — Borradaile 1903: 540. — Balss 1914: 88. — De Man 1928: 16. — Kamita 1957: 105, fig. 47. — Sakai 1962: 27, pls 5-7, figs 1-25. — Sakai & Miyake* 1964: 86, figs 1-3. — Miyake 1967: 632. — Sankolli 1970: 235, figs 1, 2. — Yaldwyn & Wear 1972: 137, figs 13-20. — Not Johnson 1972: 406 (= *Laomedia* cf. *paucispinosa*). — Kim 1973: 589, fig. 14. — Le Loeuff & Intès 1974: 23. — Fukuda* 1982: 19, figs 1-7.

TYPE. — Japan, mouthparts (RMNH D 42203), remainder of holotype missing.

MATERIAL EXAMINED. — **China.** Kiaochou Bay, Qingdao, J. Y. Liu coll., 26.VI.1956: 1 ♀, cl. 14.5 mm, tl. 37.5 mm (MNHN-Th 716).

Japan. Tataru River, Fukuoka-ville (Kyushu North), 13.V.1961, K. Sakai coll.: 1 ovig. ♀, cl. 21 mm, tl. 59 mm (MNHN-Th 432). — Yoshino-gawa, Tokushima, K. Sakai coll. 9.VIII.1991: 1 ♀, cl. 14.5 mm, tl. 39 mm (SMF 23135). — Estuary of the Tataru River, 12.V.1963, K. Sakai coll.: 1 ♀, cl. 17 mm, tl. 45 mm, 1 ♂, cl. 15 mm, tl. 36 mm (RMNH D 20131). — Miyana River estuary, Ishigaki, Ryukyu, 14.II.1973, K. Sakai coll.: 1 ♀, cl. 9.5 mm, tl. 25 mm, 1 ♂, cl. 10 mm, tl. 27 mm (RMNH D 35022). — Estuary of Tataru River near Fukuoka, K. Sakai coll. (no date): 1 ♀, cl. 20.5 mm, tl. 55 mm, 1 ♂, cl. 16 mm, tl. 48 mm (in poor condition) (BM-1963.12.31.192-193). — Ishigaki, K. Sakai coll., 1977: 1 ♂, cl. 8 mm, tl. 19.5 mm (MNHN-Th 615).

Taiwan. Peng-Hu Island, west of Taiwan, intertidal mud flat, T. Y. Chan coll., 11.V.1991: 1 ovig. ♀, cl. 11.5 mm, tl. 28 mm (MNHN-Th 1308). — Hou-Long, Hsin-chu County, NW Taiwan, September 1990: 3 ♀♀ (1 dissected), cl. 12-16 mm, tl. 29.5-39.5 mm and 1 ♂, cl. 16 mm, tl. 39.5 mm (MNHN-Th 1309).

Vietnam. Tonkin (North Vietnam), Lichtenfelder coll., 1897 (?): 1 ♀, cl. 8 mm, tl. 21.5 mm (MNHN-Th 805). — Ha-Long Bay, under a stone, on the beach, R. Boistel coll. August 1994: 3 ♀♀, cl. 7.5-14 mm, tl. 19.5-34 mm and 1 ♂, cl. 6 mm, tl. 16 mm (MNHN-Th 1301). — Estuary of Cam River, Hai Phong, K. Wada coll., near coast, str R, 24.XI.1995: 1 ♀, cl. 10.5 mm, tl. 29 mm and 1 ♂, cl. 9.5 mm, tl. 26 mm (SMF 23134). — Same locality, 4 km up from coast, in mud, str P, 9.XII.1995: 1 ♀, cl. 8 mm, tl. 22 mm (SMF 23130). — Same sta-

tion, 11.XII.1995: 1 ♀, cl. 11 mm, tl. 30 mm (SMF 23129). — Str P7, 23.XI.1995: 1 ♂, cl. 11.5 mm, tl. 31.5 mm (SMF 23131). — Str Q5, 24.XI.1995: 1 ♀, cl. 8.5 mm, tl. 23 mm (SMF 23132). — Str Q, 15.XII.1995: 1 ♀, cl. 8.5 mm, tl. 23.5 mm (SMF 23133).

Malaysia. Pt. Swettenham, mangrove swamps, Asit Kumar coll., 20.I.1969: 1 ♂, cl. 4.5 mm, tl. 15.5 mm, left P1-P5, right P1, P3, P5 present, Johnson det., 1972 (ZRC J 11898).

DISTRIBUTION. — Japan, Korea, China, Taiwan, Vietnam; usually in shallow brackish water.

DIAGNOSIS

Rostrum with obtuse apex and a pair of distal teeth; lateral borders with five to seven teeth, one postocular spine. Antennular peduncle shorter than antennal peduncle, not overreaching middle of last article. Pereopod 1 ischium and merus with spines on lower margin; carpus and propodus with spines and spinules on upper margin; dactylus with longitudinal external groove. Telson slightly longer than wide, lateral borders unarmed, convex, with distal notch; no longitudinal median groove on posterior half; posterior border rounded.

DESCRIPTION

Given in detail by Sakai (1962); a few characters are here added.

Carapace rounded dorsally, *linea thalassinica* and cervical groove clearly defined. Rostrum (Fig. 1A, C) approximately triangular, obtuse apex, with a pair of distal teeth, five to seven lateral teeth and a large postocular spine. Same shape and spinulation of rostrum in a small specimen (tl. 16 mm) from Vietnam (MNHN-Th 1301, Fig. 1C). Telson (Fig. 1G) slightly longer than wide, lateral border convex, a small notch near posterior border, the latter rounded. Antennular peduncle (Fig. 1A, C) with ultimate article the longest but tip not overreaching middle of last article of antennal peduncle. Antennal peduncle (Fig. 1A, C, H) with suture between second and third article visible dorsally; antennal scale elongate, with rounded tip bearing few

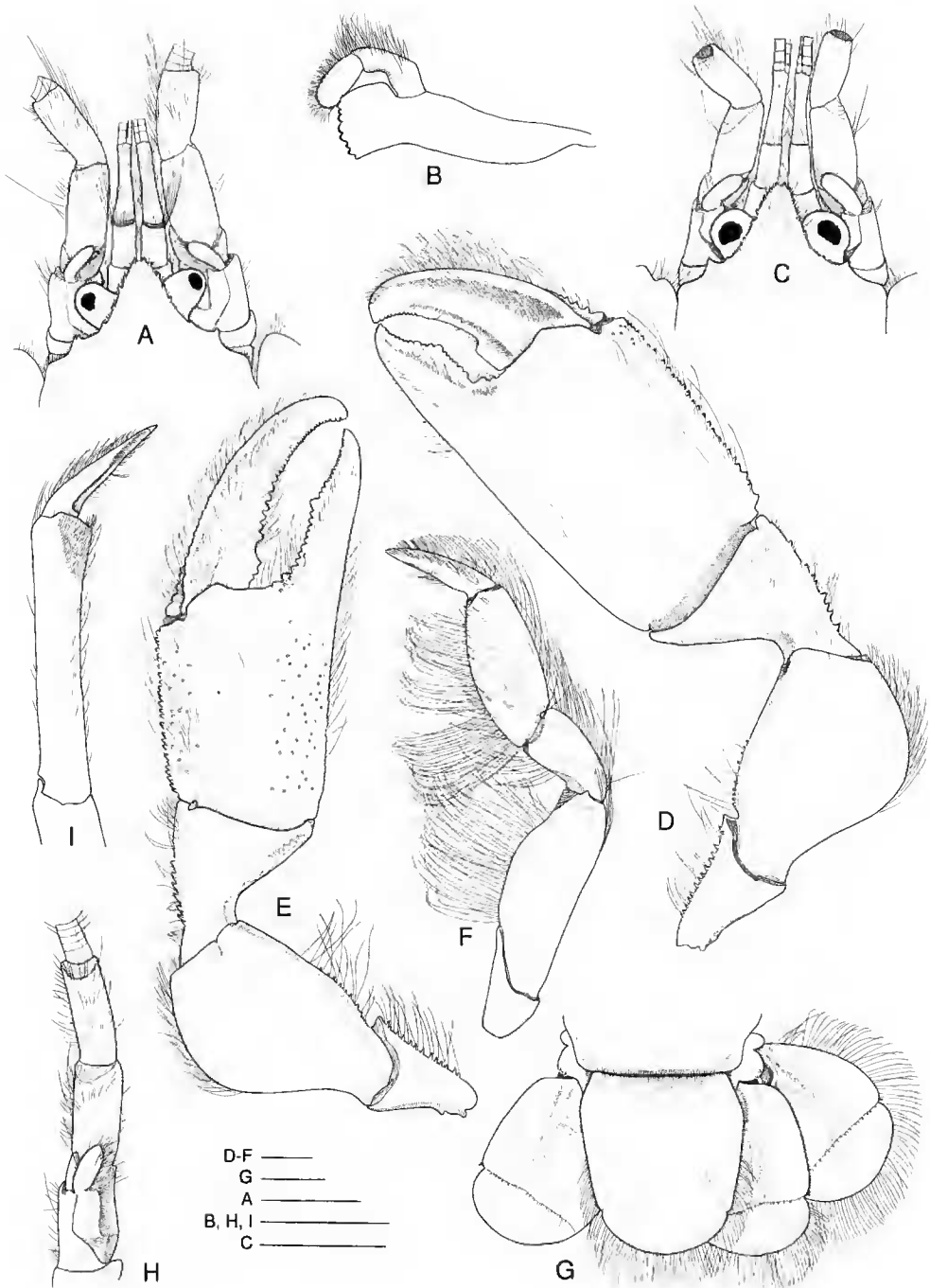


FIG. 1. — *Laomedea astacina* De Haan. A, G, I, ♂, Taiwan, tl. 39.5 mm (MNHN-Th 1309); B, H, ♀, Taiwan, tl. 39.5 mm (MNHN-Th 1309); C, ♂, Vietnam, tl. 16 mm (MNHN-Th 1301); D-F, ♀, Japan, tl. 59 mm (MNHN-Th 432). A, C, anterior part of carapace, dorsal view; B, mandible; D, E, left and right pereopod 1; F, pereopod 2; G, telson and uropods; H, left antenna, dorso-lateral view; I, distal part of pereopod 5, lateral view. Scale line: 2 mm (except for C, 1 mm).

setae. Mandible (Fig. 1B) with 2-segmented palp. Pereopod 1 (Fig. 1E, D) subequal, either left or right stouter, with spines and spinules on whole lower margin of ischium and on proximal half only in merus; carpus and propodus with spines and spinules on upper border and upper mesial surface; propodus of stouter pereopod about 1.4 times as long as wide and twice length of dactylus, propodus of slender pereopod approximately 1.6 times as long as wide and slightly longer than dactylus, fixed finger of both pereopods with cutting edge bearing small round teeth with median one the largest and more or less elevated; cutting edge of dactylus on stouter pereopod 1 with large, flat proximal tooth and small round teeth distally; cutting edge of dactylus on slender pereopod 1 with small round teeth on whole length, size decreasing distally; dactylus of both with few teeth on proximal upper border and longitudinal external groove nearly reaching tip of article. Pereopod 2 (Fig. 1F) unarmed, propodus about twice as long as large, lower border convex. Pereopod 5 propodus (Fig. 1I) with short ventral distal setae and longer ones near base of dactylus; dactylus about half as long as propodus, slender, with corneous rip. Uropod (Fig. 1G) with sharp spinules on suture of both rami, exopod ovate, endopod approximately rectangular; basipod with two to three posterior spinules.

Variations

Rostrum with pointed apex as distal teeth are narrowly spaced (female, tl. 23 mm, SMF 23132) or sitting side by side (female, tl. 22 mm, SMF 23130 and male, tl. 31.5 mm, SMF 23131) or unique (female, tl. 25 mm, ZML-D 35022); pereopods 1, though with typical dentition, are both slender and similar in size (male, tl. 31.5 mm, ZMF 23131).

REMARKS

A male from mangrove swamps of Pt. Swettenham, Malaysia and assigned by Johnson (1972) to *L. astacina*, has been examined and figured (Fig. 4). This specimen is provided with a long rostrum (Fig. 4C), far overreaching the eyes and much longer than in specimens of *L. astacina*. It partly explains the discrepancy between the measure of the carapace length given by

Johnson (3.6 mm, rostrum probably excluded) and in this work (4.5 mm, rostrum included). Other characters that make Johnson's identification doubtful include, in particular, its rostrum with a single distal tooth, its lateral rostral border unarmed and the absence of a postocular spine. This Malaysian specimen is more similar to *Laomedea paucispinosa* n.sp. and will be treated again under the latter.

The only detailed description of *Laomedea astacina* (Sakai, 1962) contains a number of mistakes. The illustrations given were made from an ovigerous female of *Tatara* (Cat. No. 54) which was later donated to Paris Museum (MNHN-Th 432). Both of its pereopods 1 and its right pereopod 2 are here figured as certain details were overlooked by Sakai. Examination of the present material of *L. astacina* confirms that its branchial formula is the same as that of *L. beulyi* (Yaldwyn *et* Wear, 1972), *L. barronensis* Ngoc-Ho *et* Yaldwyn, 1997 and *L. paucispinosa* n.sp.

Most known specimens of *L. astacina* come from estuaries or coastal areas near rivers, usually exposed to brackish water. The species is distributed in the western Pacific of relatively low temperatures and the southern limit known at present is North Vietnam. Specimens are apparently larger in northern areas, more than 21 mm in cl. (59 mm in tl.) in Japan (Sakai 1962), 52 mm in tl. in Korea (Kamita 1957, fig. 47), and sizes diminish southwards. There is no specimen exceeding 39.5 mm in tl. from Taiwan and none larger than 34 mm from Vietnam.

L. astacina is related to *L. paucispinosa* n.sp. which is also its nearest geographical neighbour. Most resemblance with the latter species, in the shape of the rostrum and pereopod 1, is found in the material of *L. astacina* from North Vietnam, especially with specimens caught in the estuary of Cam River, 4 km upstream from the coast (ZMF 23129-23132), presumably in brackish water. As *L. paucispinosa* comes from a similar but warmer habitat, it can be speculated that, in warm areas, *L. astacina* is replaced by *L. paucispinosa*.

Laomedea paucispinosa n.sp. (Figs 2, 3)

TYPE MATERIAL. — **Vietnam.** Duyen Hai

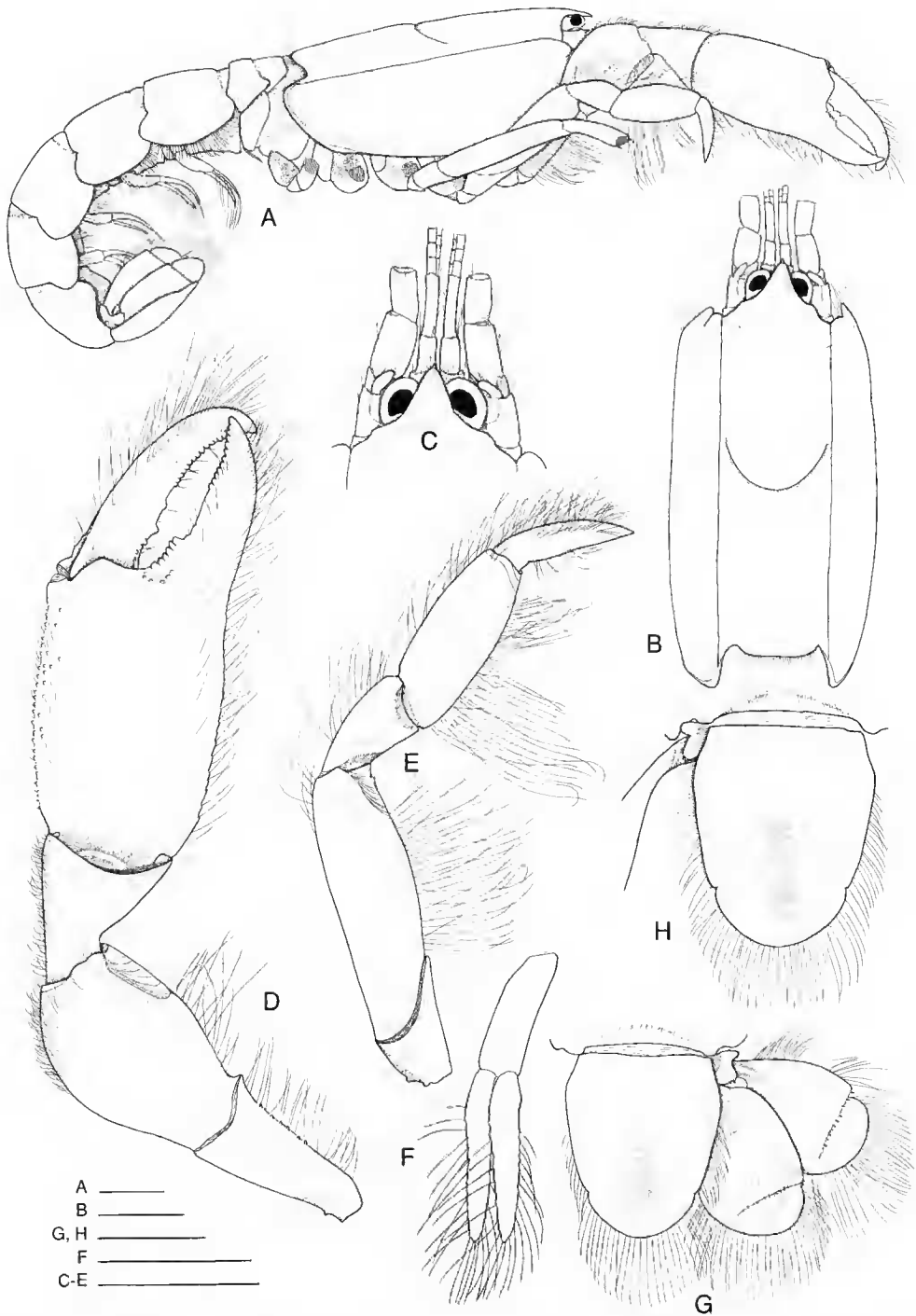


FIG. 2. — *Laormedia paucispinosa* n.sp. A-E, G, holotype, ♂, tl. 13 mm (MNHN-Th 1310); F, H, paratype, ♀, tl. 15 mm (MNHN-Th 1311). A, lateral view; B, carapace, dorsal view; C, anterior part of carapace; D, E, pereopod 1 and 2 respectively, lateral view; F, pleopod 2; G, H, telson and uropods. Scale line: 1 mm.

(HochiMinh City), in mangroves, about 500 m from Dong Tranh River and 2 km from coast, 30 cm deep in mud, Tran-Phi-Hung & Duong-ngoc-Dung coll., 10.VIII.1995: 1 ♂, cl. 4.5 mm, tl. 13 mm, right P1, P2, P3 (without dactylus) and left P5 present (holotype, MNHN-Th 1310); 1 ♀, cl. 5 mm, tl. 15 mm, left P2, P5 present (paratype, MNHN-Th 1311).

ETYMOLOGY. — The species name (*pauci* = few, *spinosa* = spines) refers to the small number of spines on the rostrum.

DIAGNOSIS

Rostrum triangular with pointed apex bearing one distal tooth, lateral borders unarmed, postocular spine absent. Antennular and antennal peduncles of approximately same length. Pereopod 1 ischium with denticles on lower margin, propodus with spinules on upper margin and upper part of mesial surface. Telson about 1.2 times as long as wide, with faint median longitudinal groove on posterior half; lateral borders convex, converging posteriorly, with distal notch; posterior border approximately semicircular, narrower at notch level than proximal.

DESCRIPTION

Carapace (Fig. 2A-C) dorsally rounded, *linea thalassinica* and cervical groove well defined; rostrum triangular with pointed apex bearing single distal tooth, lateral borders unarmed, postocular spine absent. Abdominal somite 1 (Fig. 2A) shortest, somite 6 longest, somites 2-5 subequal in length, with pleuron produced lateroposteriorly, overlapping adjacent. Telson (Fig. 2G, H), about 1.2 times as long as wide in the holotype as well as in the slightly larger paratype, with faint median dorsal groove on posterior half, small notch on posterior third of lateral border; posterior border approximately semicircular, about 0.8 time narrower at notch level than proximal. Body covered with a thin layer of material of light orange colour.

Eyestalks short, cornea well pigmented. Antennular and antennal peduncles (Fig. 2B, C) of approximately same length. Antennular peduncle (Fig. 3A) with articles 1 and 3 subequal in length and about twice as long as article 2, latter with one to two distal spinules; outer flagellum longer than inner, with distal aesthetascs. Antennal scale (Figs 2B, C, 3B) small, elongate, with rounded

apex bearing setae; suture between peduncular articles 2 and 3 visible dorsally; penultimate article slightly longer than last, with rows of short setae. Mandible (Fig. 3E) cutting edge with round teeth on whole length; palp 2-segmented. Maxillule and maxilla endopods (Fig. 3C, D respectively) long and narrow, unsegmented; maxilla scaphognathite bearing six to seven long setae posteriorly.

All three maxillipeds with long and prominent exopods consisting of a peduncle and a flagellum, the latter with slightly dilated distal half bearing long setae. Maxilliped 1 (Fig. 3F) with endopod enlarged distally, epipod large, approximately triangular. Maxilliped 2 endopod (Fig. 3G) 5-segmented, merus longest with numerous setae on mesial border, propodus enlarged distally, podobranch and small epipod present. Maxilliped 3 endopod (Fig. 3H) 5-segmented, ischium bearing prominent mesial crest of thirteen to fourteen teeth; epipod comprising small anterior lobe, podobranch and large, serrate-margined posterior lobe. One arthrobranch on maxilliped 1, two on maxillipeds 2 and 3.

Pereopod 1 (Figs 2D, 3I) slender; ischium with six denticles on whole lower margin; merus, about 1.5 times as long as ischium, and carpus unarmed; propodus 1.5 times as long as wide, bearing spinules on upper margin and upper part of mesial surface; fixed finger with small round tubercles near base, round teeth on proximal third and distal half of cutting edge; dactylus bearing two to four small teeth on proximal third of cutting edge, the largest near proximal fourth, distal half with small rounded teeth. Pereopod 2 bearing few setae, unarmed with merus about 3 times as long as wide, and 1.5 times as long as propodus; propodus 2.5 times as long as wide, upper and lower margins nearly straight. Epipod comprising short anterior and long posterior lobe and two arthrobranches on pereopods 1-4.

Small left pleopod 1, uniramous and 2-segmented, present on male holotype; pair of similar pleopods 1 on female paratype; pleopods 2-5 (Fig. 2F) with slender basipod and lanceolate endopod and exopod.

Uropod (Fig. 2G), basipod with two to three posterior spinules on inner lobe; exopod slender, endopod ovate, both with rounded posterior border and fine spinules on suture.

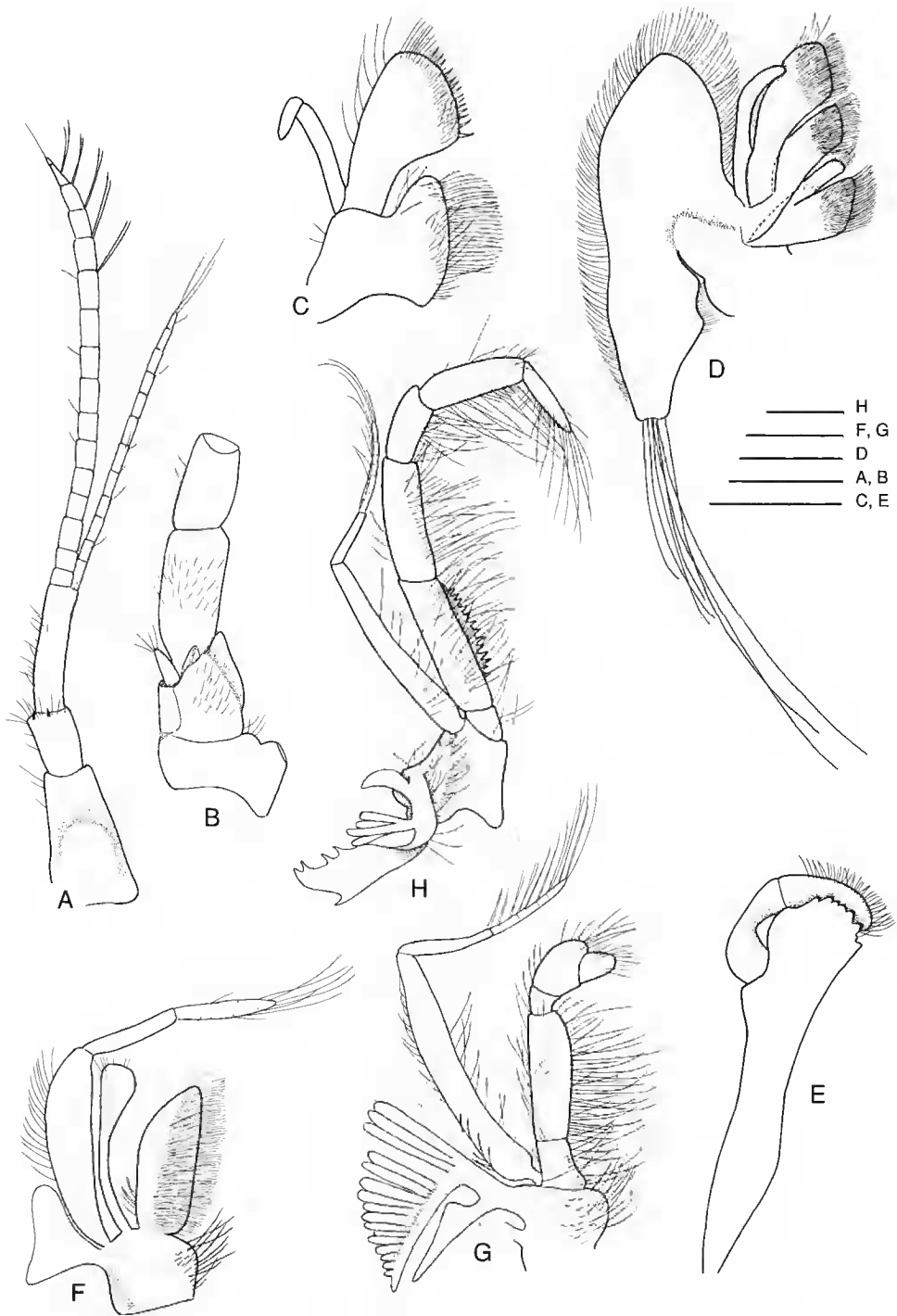


FIG. 3. — *Laomedea paucispinosa* n. sp., paratype, ♀, tl. 15 mm (MNHN-Th 1311). A, B, right antennule and antenna, dorso-lateral view; C, maxillule; D, maxilla; E, mandible; F, G, H, maxilliped 1, 2 and 3 respectively, arthrobranchs omitted. Scale line: 0.5 mm.

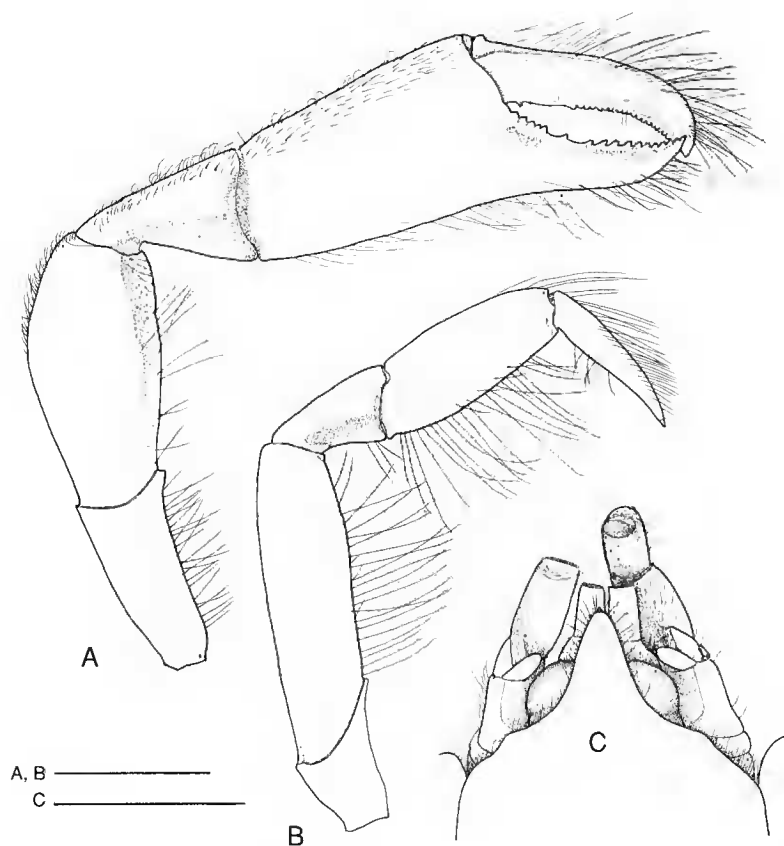


FIG. 4. — *Laomedea* cf. *paucispinosa*. ♂, Malaysia, tl. 15.5 mm (ZRC J11898). A, B, pereopod 1 and 2 respectively, lateral view; C, anterior part of body, dorsal view. Scale line: 1 mm.

REMARKS

Though small, the types of *L. paucispinosa* are probably young adults as gonopores are well open in both specimens. They were collected together perhaps as a mated pair in the same burrow. An unusual feature is found in the male holotype as the left pleopod 1 is present. It is possibly a variation and its frequency can only be confirmed when more material is available.

The new taxon resembles *L. astacina* in the shape of the rostrum in certain specimens and in the slender pereopod 1 whose fixed finger and dactylus are about as long as the palm. But the two can be differentiated readily by the following features: (1) rostrum with one distal spine, lateral borders unarmed, postocular spine absent in

L. paucispinosa (with two distal spines, five to seven spines on lateral borders and one postocular spine in *L. astacina*); (2) antennular peduncles about as long as antennal peduncle in *L. paucispinosa* (shorter than antennal peduncle in *L. astacina*); (3) pereopod 1 with unarmed carpus, dactylus without external longitudinal groove in *L. paucispinosa* (with spines on upper border of carpus, dactylus with external longitudinal groove in *L. astacina*); (4) pereopod 2 propodus 2.5 times as long as wide, lower border nearly straight in *L. paucispinosa* (pereopod 2 propodus twice as long as wide, lower border convex in *L. astacina*); (5) telson narrower distally than proximally, 1.2 times as long as wide, with faint median groove on posterior half in

L. paucispinosa (about as wide distally as proximally and about as long as wide, median groove absent in *L. astacina*).

There are more similarities between *L. paucispinosa* and *L. barronensis* which are compared under the latter species.

The male specimen of *Laomedea* from Malaysia (Fig. 4A-C), of 15.5 mm tl., bearing small gonopores on pereopods 5, agrees with this new taxon in many features: (1) rostrum with one distal tooth (hardly visible), lateral borders unarmed, postocular spine absent; (2) antennular and antennal peduncles presumably of about same length (distal border of both antennular and antennal penultimate article approximately at same level), antennal scale small, elongate; (3) pereopod 1: similar carpus/merus and propodus/fingers length ratios; (4) pereopod 2 with few setae, upper and lower margins nearly straight; (5) telson with faint median dorsal groove, posterior border semi-circular, narrower than proximal. It differs from *L. paucispinosa* (holotype is a male of 13 mm tl.), nevertheless, by: (1) pereopod 1 slender, with all articles unarmed, propodus slightly dilated distally (pereopod 1 stouter, ischium and propodus with denticles or spinules, propodus non dilated distally in *L. paucispinosa*); (2) rostrum long, overreaching the eyes by nearly half of its length (about 1/3 of its length in *L. paucispinosa*). Until more material is available from the same area, it is not possible to ascertain whether or not these differences are mere variations. The Malaysian specimen is provisionally designated here as *Laomedea* cf. *paucispinosa*.

Laomedea barronensis

Ngoc-Ho et Yaldwyn, 1997
(Fig. 5)

Laomedea n.sp. Yaldwyn et Wear, 1972: 126. – Poore & Griffin 1979: 284.

Laomedea barronensis Ngoc-Ho et Yaldwyn, 1997: 337.

MATERIAL EXAMINED. — **Australia.** Barron River, near Cairns, Queensland, from a *Sesarma* burrow system in a muddy bank of a mangroved-lined stretch of the river; J. C. Yaldwyn coll., 25.XI.1963; holotype, ovig. ♀, cl. 9.5 mm, tl. 29 mm (AM-P18362).

DISTRIBUTION. — Australia (Queensland).

DIAGNOSIS (from Ngoc-Ho & Yaldwyn 1997)

Rostrum triangular with approximately pointed apex and a pair of distal teeth, each lateral border with a single tooth, no postocular spine. Antennular and antennal peduncles subequal in length; antennal scale small, rounded. Pereopod 1 ischium and merus with spinules on lower margin, propodus slightly dilated distally with spinules on upper margin and upper part of mesial surface; fixed finger and dactylus with large flattened teeth on proximal half of cutting edge and small rounded teeth distally; dactylus bearing lateral and mesial longitudinal upper crests. Telson slightly longer than broad, without median groove; lateral borders nearly parallel, with distal notch; posterior border convex, as wide at level of notch as at proximal margin.

REMARKS

This species was described in detail by its authors. Its diagnosis and one figure (Fig. 5A-D) are here given for comparison with *L. paucispinosa* n.sp. The new taxon and *L. barronensis* are similar in: (1) triangular shape of the rostrum, few or no teeth on lateral borders; (2) no postocular spine; (3) antennular and antennal peduncles of about same length; (4) pereopod 1 with similar spination on lower border of ischium and upper border of propodus; (5) lower border of pereopod 2 propodus nearly straight.

They differ as follows: (1) rostrum with one distal tooth, lateral borders unarmed in *L. paucispinosa* (with a pair of distal teeth, lateral border with one spinule in *L. barronensis*); (2) antennal scale elongate in *L. paucispinosa* (small, rounded in *L. barronensis*); (3) slender pereopod 1 ischium about two third as long as merus, propodus non dilated distally, fixed finger and dactylus with small teeth on proximal half, dactylus with weak longitudinal crest near upper external border in *L. paucispinosa* (ischium less than half as long as merus, propodus dilated distally, fixed finger and dactylus with large flat teeth on proximal half, dactylus with longitudinal crest near upper border of both external and mesial surface in *L. barronensis*); (4) pereopod 2 bearing few setae; propodus 2.5 times as long as large, not tapering distally in *L. paucispinosa* (per-

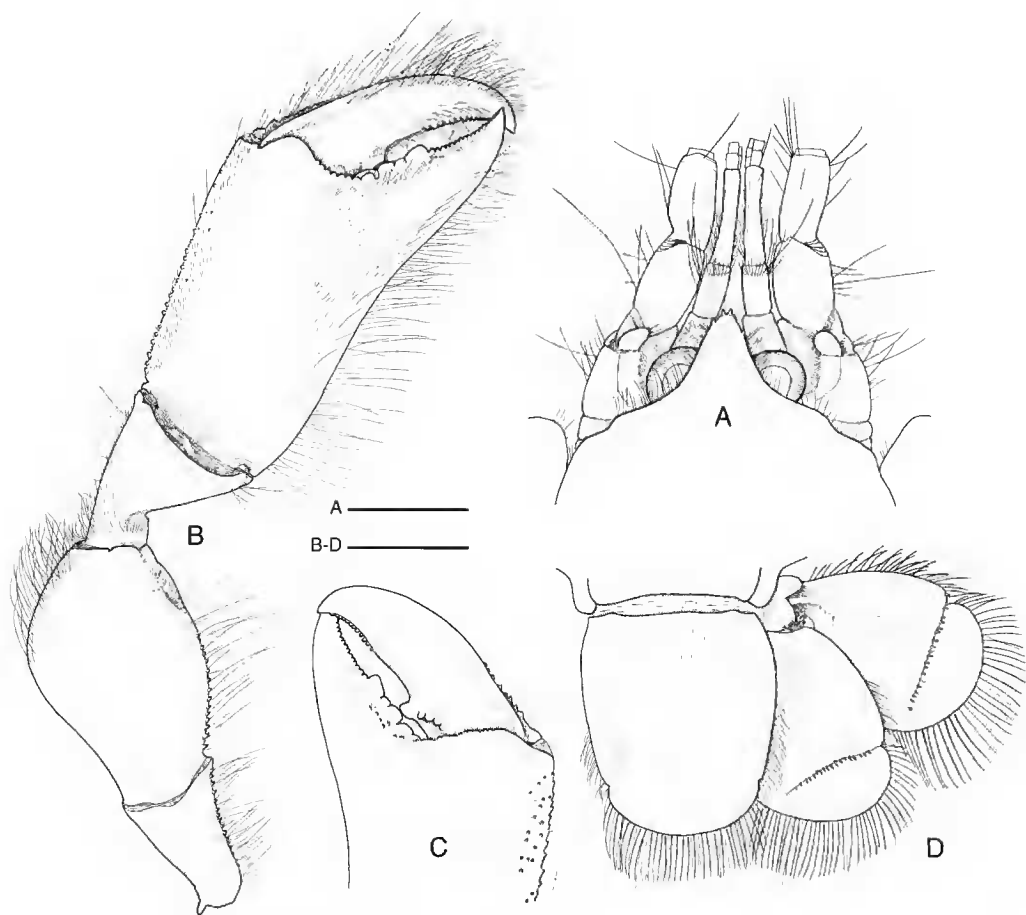


FIG. 5. — *Laomedia barronensis* Ngoc-Ho *et* Yaldwyn. Holotype, ♀, tl. 29 mm (AM-P18362). A, anterior part of body, dorsal view; B, right pereopod 1, lateral view; C, distal part of same, mesial view; D, telson and uropods, dorsal view. Scale line: A, 1 mm; B-D, 2 mm (after Ngoc-Ho & Yaldwyn 1997).

copod 2 with dense setae, propodus nearly 3 times as long as large, slightly tapering distally in *L. barronensis*); (5) telson with lateral borders clearly convex, posterior border approximately semi-circular, faint median longitudinal groove on posterior half in *L. paucispinosa* (posterior border convex, lateral borders hardly so, median groove absent in *L. barronensis*).

***Laomedia healyi* Yaldwyn *et* Wear, 1970**
(Fig. 6)

Laomedia healyi Yaldwyn *et* Wear, 1970: 384, fig. 1. — Healy & Yaldwyn 1970: 68, fig. 1.

— Yaldwyn & Wear 1972: 126, figs 1-20, pls VI-VII. — Johnson 1972: 407. — Frith *et al.* 1976: 18. — Poore & Griffin 1979: 284. — Naiyanetr 1980: 23. — Abele & Felgenhauer 1982: 310.

TYPES. — Holotype: ♀, from Carcel Bay, Pittwater, near Sydney, Australia, in soft mud among mangrove pneumatophores (AM P. 15820). Paratypes from Queensland and New South Wales, Australia: 5 ♂♂ and 7 ♀♀ in the Australian Museum, 1 ♂, 1 ♀ in the Dominion Museum, Wellington, 1 ♂, 1 ♀ in the Rijksmuseum van Natuurlijke Historie, Leiden.

MATERIAL EXAMINED. — **Australia.** Hen and Chicken Bay, Parramatta River, near Sydney, M. E. Gray coll., 27.IX.1935: ♂, paratype, cl, 30 mm, tl. 85 mm (RMNH D 29868).

OTHER MATERIAL EXAMINED (by J. C. Yaldwyn). — **Australia, Queensland.** Hayman Island, Whitsunday Group, E. H. Rainford coll., August 1924, 1 ♂, cl. 17 mm (AM P 7306). — Bogimbah Creek, Fraser Island, R. Timmons coll., 3.I.1974: 1 ♂, cl. 11 mm (QM W 4774). — Mud Island, Moreton Bay, P. Davie coll., on surface, 23.III.1980: 1 ♀, cl. 29 mm (QM W 8595). — Point Talburpin, Redland Bay, from mudbank next to mangroves, T. Knight coll., 21.V.1994: 1 ♂, cl. 14 mm, 1 ♀, cl. 17 mm (QM W 19907). — Russell Island, Moreton Bay: 1 ♀, cl. 29 mm (QM W 1974). — Southport, R. Pohlman coll., 1920: 1 ♂, cl. 11.5 mm (QM W 4538).

Australia, New South Wales. 2.4 km up Wooli River, near Grafton, in mud at oyster farm, L. Bale coll., November 1969: 1 ♀, cl. 28 mm (AM P 17603). — Newcastle, D. G. Stead State Trawling Industry coll., May 1907: 1 ♀ damaged, approx. cl. 26 mm (AM P 5112). — Swansea Channel boat hole, Lake Macquarie, among mangroves, L. Ryan coll., May 1986: 1 ♂, cl. 24 mm (AM unregistered). — Woy Woy, in mud, C. Thakeray coll., March 1915: 1 ♂, cl. 24 mm (AM P 4027). — Saratoga, Brisbane Waters, in mudflat, C. Robertson coll., 13.V.1971: 1 ♀, cl. 27 mm (AM P 17836). — Apple Tree Bay, Cowan Creek, mudflats, F. Bright coll., August 1983: 1 ♂, cl. 16 mm (AM P 34212). — Port Jackson, Sydney Harbour, D. G. Stead coll.: 1 ♀, approx. cl. 23 mm (AM P 4673). — Figtree, Lane Cove River, Sydney Harbour, D. Peters coll., February 1924: 1 ♂, approx. cl. 20 mm (AM P 7079). — Careel Bay, Sydney, from mangroves *Anicernia marina*, low tide, nocturnal, P. Hutchings coll., 2.II.1973: 1 ♂, cl. 25 mm (AM P 18944). — Georges River, Sydney, N. Ruello coll., January 1973: 1 ♀, cl. 22 mm (AM P 20143), CSIRO Cronulla Marine Laboratory coll., September 1970: 1 ♂, cl. 20 mm (AM P 18088). — Port Hacking River, 0.5 mile downstream from Audley Weir, in mud and sand flat, L. Creber coll., 1986: 1 ♂, cl. 23 mm (AM unregistered). — Greenwell Point, mangroves at low tide, 20.IX.1983: 1 ♂, cl. 20 mm (AM unregistered). — Black Creek, Tuross Lake, at base of mangrove tree in mud burrow, Diane Brown coll.: 1 ♀, cl. 24 mm, bright pink-red in life (AM P 25016). — Merimbula Lake, on rocks near mouth, D. Winkworth coll., March 1990: 1 ♀, cl. 24 mm (AM unregistered).

DISTRIBUTION. — Australia: Queensland, New South Wales, Victoria (Poore, pers. comm.), Thailand (? see Remark).

DIAGNOSIS

Rostrum rounded distally, one distal tooth, three to seven teeth on lateral borders, one postocular

spine, one spine posterior to origin of *linea thalassinica*. Antennular peduncle shorter than antennal peduncle. Pereopods 1 similar, subequal, ischium and merus with spines on lower border; carpus unarmed, palm with tubercles and denticles, fixed finger with large median triangular tooth on cutting edge; dactylus with spines and tubercles on upper margin and shallow proximal external groove. Telson nearly quadrate, lateral borders with small teeth on posterior half; posterior border slightly convex, fine shallow median longitudinal groove on posterior half.

DESCRIPTION

Given in detail by Yaldwyn & Wear (1972). A few characters and figures are here added: antennular peduncle (Fig. 6A) shorter and not reaching middle of last article of antennal peduncle. Antennal peduncle (Fig. 6A) 5-segmented, last and penultimate articles of about same length, suture between articles 2 and 3 L-shaped, well visible dorsally; antennal scale elongate, bearing short setae. Pereopod 1 (Fig. 6C) heavy and well calcified. Telson (Fig. 6B) nearly quadrate, narrow longitudinal median groove on posterior half; posterior border weakly convex and nearly as wide as proximal; three to four teeth on posterior half of lateral borders, distal notch absent. Uropod (Fig. 6B) basipod with posterior spinules on internal lobe.

Variations (material examined by J. C. Yaldwyn)

Rostrum with a pair of terminal teeth (female, cl. 24 mm, AM P 25016 and male, cl. 16 mm, AM P 34212); lateral teeth closely spaced (female, cl. 29 mm, QM W 8595 and male from Port Hacking, cl. 23 mm, AM unregistered). Spines below *linea thalassinica*: missing on either side (male, cl. 14 mm, QM W 19907), two spines on either side (male, cl. 16 mm, AM P 34212), single spine on one side, two on the other (male, from Lake Macquarie, cl. 24 mm, AM unregistered and female, cl. 22 mm, AM P 20143). Telson with one to six small lateral teeth or minor irregularities not countable as teeth (female, cl. 23 mm, AM P 4673). Left pleopod 1 present in males (male, cl. 25 mm, AM P 18944 and male from Lake Macquarie, cl. 24 mm, AM unregistered).

REMARK

Laomedia bealyi was reported from Phuket Island, Thailand by Frith *et al.* (1976) and Naiyanetr (1980), but the material studied is no longer in the Reference Collection of the Phuket Marine Biological Center (Somchai Bussarawit, pers. comm.) and its identification cannot be confirmed.

DISCUSSION

Kensley & Heard (1990) compared all laomedid genera and tabulated characters for each genus. Certain of those given for *Laomedia* are here reconsidered:

1. Number of long setae on maxilla 2: it varies with the species, also with the size of specimens, e.g. six to seven in *L. paucispinosa*, twelve to fourteen in *L. astarina* and around twenty in the male paratype (RMNH D 29868) of *L. bealyi*.

2. Exopods (reduced) on pereopods 1-5: the same statement is found in Sakai (1962) and Poore (1994: 104, key), but the four *Laomedia* species examined bear no exopods on pereopods.

3. Pereopods 2 and 5 subchelate: it seems necessary to clarify the meaning of "subchelate". In this work, it refers to a pereopod whose propodus produces a fixed finger distally which is shorter than the dactylus. This fixed finger is either large or small and when it is absent, the pereopod is called "simple". In the Laomedidae, pereopod 5 is provided with a small fixed finger (subchelate) in the genera *Axianassa* and *Laurentiella* (see Le Loeuff & Intès 1974, fig. 2k, k'; Kensley & Heard 1990, figs 3G, 5I; Rodrigues & Shimizu 1992, fig. 17). By contrast, it is simple in all four known species of *Laomedia*, in *Jaxea*, and in *Naushonia* (figures and Wear & Yaldwyn 1966, fig. 1; Martin & Abele 1982, fig. 3; Berggren 1992, figs 5, 6). Also in the four species of *Laomedia* examined as well as in *Jaxea nocturna*, pereopod 2 is simple.

4. Pereopods 3 & 4 with dactylus twisted, that is "with posterior margin becoming dorsal in position" (Kensley & Heard 1990: 559): this situation is not common and probably occasional as in certain specimens, the dactylus of pereopods 3 and 4 can be twisted on the right and not on the left and vice versa.

The branchial formula (Table 1) and mouth

parts, similar in all genera, confirm the monophyly of the Laomedidae (Le Loeuff & Intès 1974). Moreover, zoea larvae of all laomedid genera, *Laurentiella* excepted, are now known (see Wear & Yaldwyn 1966; Goy & Provenzano 1978; Ngoc-Ho 1981; Fukuda 1982; Rodrigues & Shimizu 1992), and the strong link between them is the asymmetrical mandibles, the left of which sickle-shaped.

Nevertheless, the Laomedidae are a diverse family and adult and larval morphology differ between genera. The validity of the family has been debated many times, especially with the inclusion of *Axianassa*: in 1924, Schmitt created the family Axianassidae for his new genus and species *Axianassa intermedia*. Certain subsequent authors (Gurney 1938, Wear & Yaldwyn 1966, Poore & Griffin 1979) retained the family while others (De Man 1928; Balss 1957; Le Loeuff & Intès 1974; Ngoc-Ho 1981; Poore 1994) included the genus *Axianassa* in the Laomedidae and Goy & Provenzano (1979: 351) explicitly excluded it. Chace (1939), dealing with species of the genus *Naushonia*, divided the Laomedidae into the subfamilies Laomediinae and Naushoniinae but did not refer to *Axianassa*. The larvae of *Axianassa* from the plankton and laboratory hatching are now known (Ngoc-Ho 1981; Rodrigues & Shimizu 1992), and provide additional evidence for the placement of *Axianassa* in the Laomedidae.

The Laomedidae is as yet a small family with five genera and relationships between its members can be investigated more thoroughly now that adult and larval characters are better known (Tables 2, 3).

A cladistic analysis was performed to discover the most parsimonious relationships between the five genera. Adult and juvenile character states (Tables 2, 3) were converted to binary unordered characters (Table 4) and scored for the five genera (Table 5). Larval states were unavailable for *Laurentiella*.

The program Hennig86 was used and a single shortest tree of 23 steps describing their relationships was found (consistency index 73%, redundancy index 70%). Two well defined clades were revealed:

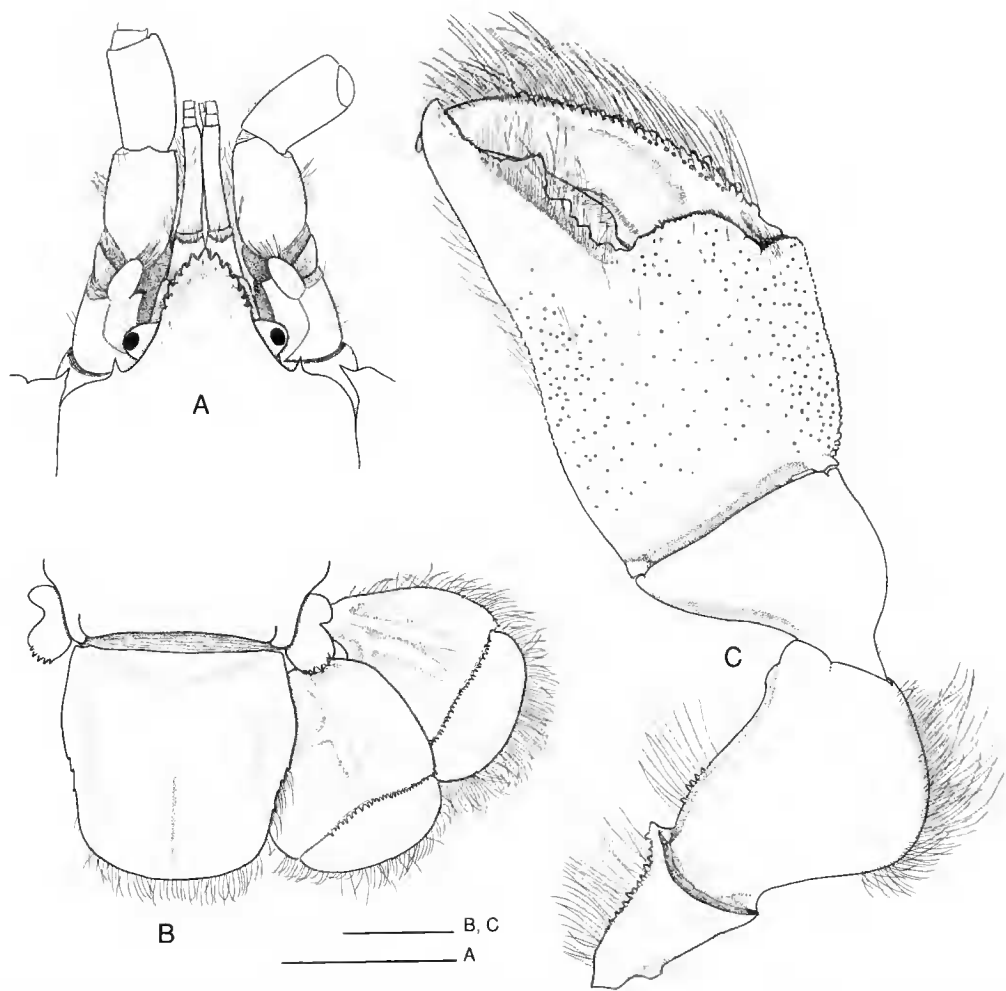


FIG. 6. — *Laomedea healyi* Yaldwyn et Wear. Paratype, ♂, tl. 85 mm (RMNH 29868). A, anterior part of carapace, dorsal view; B, telson and uropods, dorsal view; C, pereopod 1, lateral view. Scale line: 5 mm.

Laurentiella and *Axianassa* – defined by antennal scale spiciform (character 4); maxilliped 3 exopod absent (6); pereopod 1 subchelate (7) and subequal (8); pereopod 5 subchelate (9); and uropodal surures on outer rami or absent.

Laomedea, *Jaxea* and *Naushonia* – defined by rostrum armed (character 1); antenna 1 peduncle, article 3 short (2) (except in *Jaxea*); larval rostrum curved (11); larval “neck” region elongated (12); and telson (at early larval stages) broadly triangular (16). The first two of these three genera are more similar to each other than each is to

Naushonia sharing three characters not convergent elsewhere: antennal scale reduced (3); larval abdominal somite 6 with hooks from stage 3 (15); and telson (at late larval stages) with 3 lateral processes (17).

Two subfamilies can therefore be recognized on the basis of this analysis: *Axianassinae* and *Laomedinae*.

Acknowledgements

I wish to thank the Australian Museum, Sydney (Penny Berents), the Natural History Museum,

TABLE 2. — Comparison of adults in the five genera of the Laomedidae (adapted from Kensley & Heard 1990).

Characters	<i>Laomedia</i>	<i>Jaxea</i>	<i>Naushonia</i>	<i>Axianassa</i>	<i>Laurentiella</i>
rostrum	armed	armed	armed	unarmed	unarmed
article 3 of peduncle a1	elongate	elongate	short	elongate	short
antennal scale	reduced	reduced	well-developed	spiciform	spiciform
mandibular palp	2-segm.	2-segm.	2/3-segm.	3-segm.	2-segm.
maxilliped 3 exopod	present	present	present	absent	absent
pereopods 1	chelate subequal	chelate equal	subchelate equal	chelate subequal	chelate subequal
pereopod 5	simple	simple	simple	subchelate	subchelate
uropodal sutures	on both rami	on both rami	on both rami	absent	on outer rami

TABLE 3. — Comparison of larvae in four genera of the Laomedidae (after Gurney 1938; Gurney & Lebour 1939; Wear & Yaldwyn 1966; Goy & Provenzano 1978; Ngoc-Ho 1981; Fukuda 1982).

Characters	<i>Laomedia</i>	<i>Jaxea</i>	<i>Naushonia</i>	<i>Axianassa</i>
rostrum	curved	curved	curved	straight
"neck" region	elongated	elongated	slightly elongated	non-elongated
hooks on abdominal segments 1-5	present	present	present	absent
spines on abdominal segment 5	absent	absent	absent	present
hooks on abdominal segment 6	from stage 3	from stage 3	absent	absent
telson (early stages)	<.....triangular, large base.....> <.....1 pronounced lateral process.....>			triangular, narrow base,
1 small lateral process				
telson (late stages)	3 lateral processes	3 lateral processes	1 lateral process	1 lateral process

TABLE 4. — Characters used in the cladistic analysis. Each character is treated as binary and is followed by its alternate states (0 and 1).

1. Rostrum: unarmed; armed.
2. Antenna 1 peduncle, article 3: elongate; short.
3. Antennal scale: well-developed; reduced.
4. Antennal scale: broad; spiciform.
5. Mandibular palp articles: 3; 2.
6. Maxilliped 3 exopod: present; absent.
7. Pereopod 1: chelate; subchelate.
8. Pereopods 1: equal; subequal.
9. Pereopod 5: simple; subchelate.
10. Uropodal sutures: on both rami, on outer rami or absent.
11. Larval rostrum: straight; curved.
12. Larval "neck" region: not elongated; elongated.
13. Larval abdominal somites 1-5: without hooks, with hooks.
14. Larval abdominal somite 5: without spines, with spines.
15. Larval abdominal somite 6: without hooks, with hooks from stage 3.
16. Telson (at early larval stages): narrowly triangular; broadly triangular.
17. Telson (at late larval stages): with one lateral process; with three lateral processes.

TABLE 5. — States of seventeen characters (see Table 4) in five laomediid genera used in the cladistic analysis. The outgroup was scored 0 for all characters; all characters are unordered.

Genera	Characters																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Laomedea</i>	1	1	1	0	1	0	1	1	0	0	1	1	0	0	1	1	1
<i>Jaxea</i>	1	0	1	0	1	0	1	0	0	0	1	1	1	0	1	1	1
<i>Naushonia</i>	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0
<i>Axianassa</i>	0	0	0	1	0	1	1	1	1	1	0	0	0	1	0	0	0
<i>Laurentiella</i>	0	1	0	1	1	1	1	1	1	1	?	?	?	?	?	?	?

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